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(54) **Photographic colour material**

(57) A photographic fluorescent interlayer scanning readout film comprised of:
a support and, coated on the support,
a sequence of superimposed red-, green- and blue-recording silver halide emulsion layer units that produce silver images of substantially the same hue upon processing, and one of said units contains a dye image forming compound capable of forming a dye image spectrally distinguishable from the silver images on development,
and a fluorescent or luminescent layer located between two of the non-dye image forming units. The dye-image forming compound is preferably a colour coupler in the blue layer but may be a leuco dye, a redox dye releaser or a hidden dye which produces a dye on development by removal of a blocking group.

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PHOTOGRAPHIC MATERIAL AND METHOD OF OBTAINING COLOUR IMAGE RECORDS THEREFROM

Field of the Invention

The invention is directed to a method of extracting blue, green and red exposure records from an imagewise exposed silver halide photographic element and to a photographic element particularly adapted for use in the method.

Background of the Invention

With the emergence of computer controlled data processing capabilities, interest has developed in extracting the information contained in an imagewise exposed photographic element instead of proceeding directly to a viewable image. It is now common practice to extract the information contained in both black-and-white and colour images by scanning. The most common approach to scanning a black-and-white negative is to record point-by-point or line-by-line the transmission of a near infrared beam, relying on developed silver to modulate the beam. Another approach is to address an area of the black-and-white negative relying on modulated transmission to a CCD array for image information recording. In colour photography blue, green and red scanning beams are modulated by the yellow, magenta and cyan image dyes. In a variant colour scanning approach the blue, green and red scanning beams are combined into a single white scanning beam modulated by the image dyes that is read through red, green and blue filters to create three separate records. The records produced by image dye modulation can then be read into any convenient memory medium (e.g., an optical disk). The advantage of reading an image into memory is that the

information is now in a form that is free of the classical restraints of photographic embodiments. For example, age degradation of the photographic image can be for all practical purposes eliminated. Systematic manipulation (e.g., image reversal, hue alteration, etc.) of the image information that would be cumbersome or impossible to achieve in a controlled and reversible manner in a photographic element are readily achieved. The stored information can be retrieved from memory to modulate light exposures necessary to recreate the image as a photographic negative, slide or print at will. Alternatively, the image can be viewed as a video display or printed by a variety of techniques beyond the bounds of classical photography--e.g., xerography, ink jet printing, dye diffusion printing, etc.

Schumann et al in U.S.Patent 4 543 308 describe the measurement of luminescence intensities in exposed and processed photographic film by means of a commercial emission spectrometer, utilising monochromators on both the illumination and detection sides of the instrument. Relying on differentials in luminescence from spectral sensitising dye, the preferred embodiment of Schumann et al, is unattractive, since luminescence intensities are limited. Increasing spectral sensitising dye concentrations beyond optimum levels is well recognised to desensitise silver halide emulsions.

Our copending and, as yet unpublished, European Application No 94200242.9 describes a colour photographic system which uses a colour film comprising red-, green-, and blue-sensitive silver halide emulsion layer units (without any dye image-forming materials) with at least one fluorescent interlayer between two of the colour-sensitive silver

halide layer units which form silver images of substantially the same hue. The colour records are read out by scanning the image by transmission or reflection. As is well understood the fluorescent or luminescent layers need to be excited at a particular wavelength to stimulate the production of radiation at another wavelength. The preferred method is to expose to exciting radiation through an appropriate filter or filters and to read the emission through a further filter or filters to confine the layer excited and the emission read to the image in the desired layer.

Problem to be Solved by the Invention

The prior art fluorescent interlayer scanning readout films require two doubly spectrally filtered fluorescent scans and one transmission scan to retrieve the colour image information. This makes the scanning device difficult to build and operate. A simplified procedure of readout would be desirable.

Summary of the Invention

According to the present invention there is provided a photographic element comprised of

a support and, coated on the support,

a sequence of superimposed red-, green- and blue-recording silver halide emulsion layer units that produce silver images of substantially the same hue upon processing, and one of said units contains a dye image forming compound capable of forming a dye image spectrally distinguishable from the silver images on development,

and a fluorescent or luminescent layer located between two of the image forming units.

The invention also provides a method of obtaining from an imagewise exposed photographic element as described above, separate electronic records of the

imagewise exposure to each of the blue, green and red portions of the spectrum comprising

(a) photographically processing the photographic element so as to produce 3 silver images and a dye image corresponding to one of the silver images,

(b) transmission scanning the element through two different filters,

(c) reflection scanning by exciting the fluorescent or luminescent layer with radiation of one wavelength and reading the emitted radiation at another wavelength,

(d) obtaining the required colour records by mathematically manipulating the data acquired.

Advantageous Effect of the Invention

A single dye image may be generated in a number of ways allowing a process which could be chosen to be more environmentally acceptable than traditional colour-generating chemistries which require a set of dyes having three precisely defined (different) hues to be formed. At the same time the method and complexity of obtaining colour records described in the prior art is simplified.

Detailed Description of the Invention

Dye forming chemistries could include conventional couplers with p-phenylene diamine developer, couplers with p-aminophenol developer. Also dyes which are hypsochromically shifted out of the visible spectral region by means of a blocking group can be used wherein the blocking group is removed as a function of development by using a developer containing an electron transfer agent (ETA). Further, substances which become coloured on oxidation, such as leuco dyes or hydroquinones which form quinones, of which the required components are contained in the photographic element or in a processing solution

containing an ETA. An additional dye forming chemistry is the use of redox dye releasers which release a diffusible dye on development in the presence of an ETA. Preferred ETA's are pyrazolidinones of which 1-phenyl-3-pyrazolidinone and 4-hydroxymethyl-4-methyl-1-phenylpyrazolidinone are examples.

The present photographic material may have the following Structures:

3rd Emulsion Layer Unit
Fluorescent Interlayer
2nd Emulsion Layer Unit
1st Emulsion Layer Unit
Photographic Support

Structure I

3rd Emulsion Layer Unit
2nd Emulsion Layer Unit
Fluorescent Interlayer
1st Emulsion Layer Unit
Photographic Support

Structure II

The first, second and third emulsion layer units are each chosen to record imagewise exposure in a different one of the blue, green and red portions of the spectrum. Each emulsion layer unit can contain a single silver halide emulsion layer or can contain a combination of silver halide emulsion layers for

recording exposures within the same region of the spectrum. It is, of example, common practice to segregate emulsions of different imaging speed by coating them as separate layers within an emulsion layer unit. The emulsion layer units can be of any convenient conventional construction. In a specifically preferred form the emulsion layer units correspond to those found in conventional colour reversal photographic elements lacking an incorporated dye-forming coupler--i.e., they contain negative-working silver halide emulsions, but do not contain any image dye or image dye precursor.

One layer, however, is capable of forming a dye image and therefore contains dye image-forming means which, as previously indicated, may comprise a colour coupler, a leuco dye, blocked dye, hydroquinone or redox dye releaser.

Normally the emulsion layer units 1 to 3 are sensitive to red, green and blue light respectively.

The fluorescent interlayer is constructed to transmit electromagnetic radiation that the emulsion layer unit beneath it is intended to record.

When the emulsion layer units intended to record minus blue (green or red) also have native blue sensitivity they will require protection from blue light during imagewise exposure. This is usually accomplished by placing a yellow filter in a separate layer between the blue-sensitive layer and those layers below, eg a yellow dye.

Conventional scanning techniques satisfying the requirements described above can be employed, including point-by-point, line-by-line and area scanning, and require no detailed description. A simple technique for scanning is to scan the photographically processed element point-by-point

along a series of laterally offset parallel scan paths. The intensity of light reflected from or passing through the photographic element at a scanning point is noted by a sensor which converts radiation received into an electrical signal. The electrical signal is passed through an analogue to digital converter and sent to memory in a digital computer together with locant information required for pixel location within the image. Signal comparisons and mathematical operations to resolve scan records that represent combinations of two or three different images can be undertaken by routine procedures once the information obtained by scanning has been placed in the computer.

Once the image records corresponding to the latent images have been obtained, the original image or selected variations of the original image can be reproduced at will. The simplest approach is to use lasers to expose pixel-by-pixel a conventional colour paper. Simpson et al U.S. Patent 4,619,892 discloses differentially infrared sensitised colour print materials particularly adapted for exposure with near infrared lasers. Instead of producing a viewable hard copy of the original image the image information can instead be fed to a video display terminal for viewing or fed to a storage medium (e.g., an optical disk) for archival storage and later viewing. A number of methods exist for the printing of a colour image direct from the computer.

The multicolour photographic elements and their photographic processing, apart from the specific required features described above, can take any convenient conventional form. A summary of conventional photographic element features as well as their exposure and processing is contained in *Research*

Disclosure, Vol. 308, December 1989, Item 308119, and a summary of tabular grain emulsion and photographic element features and their processing is contained in *Research Disclosure*, Vol. 225, December 1983, Item 22534, the disclosures of which are here incorporated by reference.

The following Examples are included for a better understanding of the invention.

EXAMPLE 1

A colour recording film having a blue-sensitive emulsion layer which forms a silver image plus a coupled yellow dye image, and green- and red-sensitive layers which form silver images and having a red-emitting fluorescent interlayer interposed between them, was prepared by coating the following layers in order on cellulose triacetate film base. The layers are described in terms of coated laydown of each component as grams per square metre (g/m^2). All emulsions were sulphur-gold sensitised and spectrally sensitised to the appropriate part of the spectrum. The fluorescent dye was conventionally dispersed in the presence of the coupler solvent tricresyl phosphate, ten parts by weight of solvent to one part of dye. The silver halide emulsions were of the tabular grain type, and were silver bromoiodide having between 1 and 6 mole % iodide.

Layer 1: Antihalation underlayer

Gelatin	1.5 g/m^2
Antihalation dye	0.08

(as a dispersion of solid dye. The dye was a neutral absorber dye which dissolved out of the coating when treated with alkaline processing solution).

Layer 2: Red-sensitive layer

Gelatin	1.7
Fast red-sensitive emulsion (diameter 1.5μm, thickness 0.11 μm)	0.55
Mid-speed red sensitised. Emulsion (diameter. 0.7μm thickness 0.11 μm)	0.25
Slow red-sensitive emulsion (diameter,0.5μm thickness 0.08μm)	0.50
Scavenging agent A,	0.30

Layer 3: Interlayer

Gelatin	2.3
Red-emitting fluorescent dye RF (RF was Lumogen F Red 300, supplied by BASF AG, and was a red coloured fluorescent dye with peak emission at 610 nm. It was dissolved as a 10% w/w solution in tricresyl phosphate, and the solution dispersed in the normal way into aqueous gelatin solution).	0.20
Magenta absorber dye (as a dispersion of water-insoluble solid dye, which was soluble in alkaline processing solution).	0.15

Layer 4: Green-sensitive layer

Gelatin	2.0
Fast green-sensitive emulsion (diameter.1.5 μm, thickness 0.11 μm)	0.50
Mid green-sensitive emulsion (diameter.0.7 μm, thickness 0.11 μm)	0.25
Slow green-sensitive emulsion (diameter.0.5 μm, thickness 0.08 μm)	0.40
Scavenging agent A	0.5

Layer 5: Interlayer

Gelatin	1.3
Yellow filter dyes (as a dispersion of solid dye, which is soluble in alkaline processing solution).	0.90

Layer 6: Blue-sensitive layer

Gelatin	2.0
Fast blue-sensitive emulsion (diameter. 1.39μm, thickness 0.11μm)	0.25
Mid blue-sensitive emulsion (diameter. 0.72μm, thickness 0.084μm)	0.15
Slow blue-sensitive emulsion (diameter. 0.32μm, thickness 0.072μm)	0.30
Coupler Y	0.80
Hardener bis(vinylsulphonyl)methane	0.21

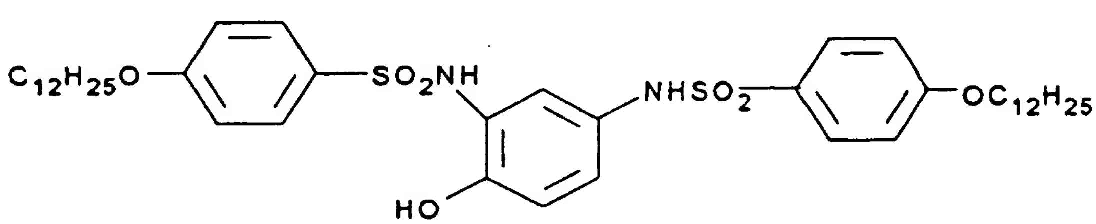
Layer 7: Supercoat

Gelatin	1.0

Also present in every emulsion-containing layer was 4-hydroxy-6-methyl-1,3,3A,7-tetraazaindene, sodium salt, at 1.5 g per mole of silver. Surfactants used to aid the coating operation are not listed in these examples.

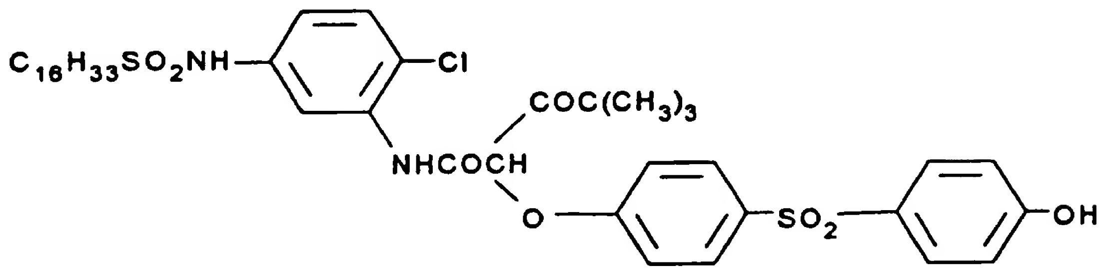
Lumogen™ F red 300 is described by the manufacturer as a perylene class fluorescent dye.

Scavenging agent A was of the following structure:



and was dispersed into gelatin solution in the presence of the solvent n-diethyl lauramide.

Coupler Y was of the following structure:



and was dispersed in gelatin solution as a solution in 2-(2-butoxyethoxy)ethyl acetate which was subsequently removed by washing the set dispersion with water:

A sample of the film was sensitometrically exposed to white light by passing light from a tungsten lamp through a Daylight 5 filter and through a graduated density step wedge. Other samples were sensitometrically exposed to red, green and blue light by passing light from a tungsten lamp through Wratten 29, 74 and 98 filters respectively and through a graduated density step wedge.

The film samples were developed for 3.25 minutes at 38°C in Kodak™ C41 developer solution, treated for 30s in a 2% acetic acid stop bath, fixed for 2 minutes in Kodak A3000 fixer solution diluted 1+3 with water, then washed in running water and dried.

The densities of the image steps on the test sample of the film were read by scanning with a transmission densitometer through blue and red Status M filters, and with a reflection densitometer in which the illuminating light was filtered through a green dichroic filter and the light returning to the densitometer was filtered through a red filter. In all cases the coated layers were on the side of the film support nearer to the densitometer detector. The

optical densities in unexposed areas of the film were assigned an arbitrary value of zero, and the blue and red transmission densities BT and RT, and the red reflection density RR, above the arbitrary zero were recorded for each exposure step.

From these values the transmission densities to a red filter of the silver image in each of the emulsion layer units was calculated as follows:

The blue-sensitive layer density bt was calculated as $bt = (BT - 1.23RT)/6.7$

The green-sensitive layer density gt was calculated as $gt = (RR - 2.6bt)/2.1$

The red-sensitive layer density rt was calculated as $rt = RT - bt - gt$.

The observed values BT, RT and GR, and the calculated densities bt, gt and rt for each exposure step for each of the exposure conditions are tabulated in Table 1.

TABLE 1:

BLUE SEPARATION EXPOSURE:

Exp. step	Rel. log E	RT	BT	bt	RR	gt	rt
1	-4.00	0.01	0.01	0.00	0.00	0.00	0.01
2	-3.81	0.01	0.01	0.00	0.00	0.00	0.01
3	-3.61	0.01	0.01	0.00	0.01	0.01	0.01
4	-3.41	0.01	0.01	0.00	0.01	0.01	0.01
S	-3.20	0.01	0.01	0.00	0.03	0.01	-0.01
6	-3.01	0.00	0.00	0.00	0.03	0.02	-0.01
7	-2.81	0.00	0.00	0.00	0.04	0.02	-0.02
8	-2.60	0.00	0.02	0.00	0.05	0.02	-0.02
9	-2.40	0.01	0.07	0.01	0.05	0.01	-0.01
10	-2.21	0.03	0.14	0.02	0.07	0.01	0.00
11	-2.01	0.04	0.24	0.03	0.10	0.01	0.00
12	-1.81	0.06	0.39	0.05	0.15	0.01	0.00
13	-1.61	0.08	0.57	0.07	0.20	0.01	0.00
14	-1.41	0.10	0.76	0.09	0.25	0.00	0.01
15	-1.21	0.12	0.95	0.12	0.31	0.00	0.00
16	-1.01	0.13	1.07	0.13	0.36	0.00	-0.01
17	-0.81	0.17	1.32	0.17	0.41	-0.01	0.02
18	-0.61	0.20	1.48	0.18	0.47	0.00	0.02
19	-0.40	0.22	1.59	0.20	0.52	0.00	0.02
20	-0.20	0.28	1.72	0.21	0.60	0.03	0.04
21	0.00	0.31	1.78	0.21	0.68	0.06	0.04

GREEN SEPARATION EXPOSURE:

Exp. step	Rel. log E	RT	BT	bt	RR	gt	rt
1	-4.00	0.01	0.02	0.00	0.00	0.00	0.01
2	-3.81	0.01	0.01	0.00	0.00	0.00	0.01
3	-3.61	0.01	0.01	0.00	0.02	0.01	0.00
4	-3.41	0.01	0.02	0.00	0.03	0.01	-0.01
5	-3.20	0.01	0.01	0.00	0.02	0.01	0.00
6	-3.01	0.01	0.01	0.00	0.02	0.01	0.00
7	-2.81	0.00	0.01	0.00	0.03	0.01	-0.01
8	-2.60	0.00	0.02	0.00	0.02	0.01	-0.01
9	-2.40	0.00	0.00	0.00	0.02	0.01	-0.01
10	-2.21	0.00	0.00	0.00	0.02	0.01	-0.01
11	-2.01	0.02	0.02	0.00	0.04	0.02	0.00
12	-1.81	0.04	0.04	0.00	0.10	0.05	-0.01
13	-1.61	0.09	0.11	0.00	0.20	0.09	-0.01
14	-1.41	0.15	0.19	0.00	0.33	0.16	-0.01
15	-1.21	0.22	0.27	0.00	0.49	0.23	-0.01
16	-1.01	0.28	0.33	0.00	0.59	0.28	0.00
17	-0.81	0.35	0.43	0.00	0.69	0.33	0.02
18	-0.61	0.40	0.50	0.00	0.79	0.38	0.03
19	-0.40	0.45	0.57	0.00	0.83	0.39	0.05
20	-0.20	0.51	0.68	0.01	0.94	0.44	0.07
21	0.00	0.61	0.79	0.01	1.01	0.47	0.13

RED SEPARATION EXPOSURE:

Exp. step	Rel. log E	RT	BT	bt	RR	gt	rt
1	-4.00	0.02	0.03	0.00	0.01	0.01	0.02
2	-3.81	0.02	0.02	0.00	0.01	0.01	0.02
3	-3.61	0.02	0.01	0.00	0.01	0.01	0.01
4	-3.41	0.01	0.01	0.00	0.02	0.01	0.00
5	-3.20	0.01	0.01	0.00	0.01	0.01	0.01
6	-3.01	0.00	0.00	0.00	0.02	0.01	-0.01
7	-2.81	0.00	0.00	0.00	0.02	0.01	-0.01
8	-2.60	0.00	0.03	0.00	0.01	0.00	0.00
9	-2.40	0.01	0.05	0.01	0.00	-0.01	0.01
10	-2.21	0.02	0.08	0.01	0.00	-0.01	0.02
11	-2.01	0.04	0.13	0.01	0.00	-0.01	0.04
12	-1.81	0.08	0.19	0.01	0.00	-0.02	0.09
13	-1.61	0.14	0.25	0.01	0.03	0.00	0.13
14	-1.41	0.20	0.30	0.01	0.03	0.00	0.19
15	-1.21	0.26	0.37	0.01	0.07	0.02	0.23
16	-1.01	0.31	0.40	0.00	0.09	0.04	0.27
17	-0.81	0.35	0.45	0.00	0.11	0.05	0.30
18	-0.61	0.40	0.49	0.00	0.14	0.07	0.33
19	-0.40	0.45	0.55	0.00	0.13	0.06	0.39
20	-0.20	0.49	0.59	0.00	0.13	0.07	0.43
21	0.00	0.54	0.64	0.00	0.14	0.07	0.47

NEUTRAL EXPOSURE:

Exp. step	Rel. log E	RT	BT	bt	RR	gt	rt
1	-4.00	0.00	0.01	0.01	0.00	0.00	0.00
2	-3.81	0.00	0.00	0.00	0.01	0.00	0.00
3	-3.61	0.00	0.01	0.00	0.02	0.01	-0.01
4	-3.41	0.01	0.01	0.00	0.01	0.00	0.00
5	-3.20	0.01	0.03	0.00	0.02	0.00	0.00
6	-3.01	0.01	0.06	0.01	0.01	0.00	0.01
7	-2.81	0.02	0.11	0.01	0.05	0.01	0.00
8	-2.60	0.03	0.20	0.02	0.10	0.02	-0.01
9	-2.40	0.06	0.35	0.04	0.16	0.03	0.00
10	-2.21	0.11	0.53	0.06	0.26	0.05	0.00
11	-2.01	0.19	0.75	0.08	0.37	0.08	0.04
12	-1.81	0.31	1.04	0.10	0.49	0.11	0.10
13	-1.61	0.44	1.31	0.11	0.66	0.17	0.16
14	-1.41	0.56	1.56	0.13	0.83	0.23	0.20
15	-1.21	0.68	1.79	0.14	0.99	0.29	0.24
16	-1.01	0.78	2.02	0.16	1.12	0.34	0.28
17	-0.81	0.87	2.23	0.17	1.25	0.38	0.31
18	-0.61	0.93	2.36	0.18	1.37	0.43	0.32
19	-0.40	1.00	2.52	0.19	1.47	0.46	0.35
20	-0.20	1.16	2.75	0.20	1.66	0.55	0.41
21	0.00	1.40	3.03	0.20	2.03	0.73	0.48

EXAMPLE 2

Samples of the film described in Example 1 were exposed and processed as in Example 1.

The densities of the image steps on the test samples of the film were read by scanning with a transmission densitometer through blue and red Status M filters, and with a reflection densitometer in which the illuminating light was filtered through a green dichroic filter and the light returning to the

densitometer was filtered through a red filter. For the transmission density readings, the coated layers were on the side of the film support nearer to the densitometer detector, but the fluorescence reflection densities were measured through the film base, that is the coated emulsion layers were on the side of the support further from the densitometer detector. The optical densities in unexposed areas of the film were assigned an arbitrary value of zero, and the blue and red transmission densities BT and RT, and the red reflection density RR, above the arbitrary zero were recorded for each exposure step.

From these values the transmission densities to a red filter of the silver image in each of the emulsion layer units was calculated as follows:

The blue-sensitive layer density bt was calculated as

$$bt = (BT - 1.23RT)/6.7$$

The red-sensitive layer density rt was calculated as

$$rt = RR/2.5$$

The green-sensitive layer density gt was calculated as

$$gt = RT - bt - rt.$$

The observed values BT, RT and RR, and the calculated densities bt, gt and rt for each exposure step for each of the exposure conditions are tabulated in Table 2.

It will be seen that these calculated densities are in reasonable agreement with the calculated densities of Example 1.

TABLE 2:

BLUE SEPARATION:

Exp. step	Rel. log E	RT	BT	RR	bt	gt	rt
1	-4.00	0.01	0.01	0.00	0.00	0.02	0.00
2	-3.81	0.01	0.01	0.00	0.00	0.01	0.00
3	-3.61	0.01	0.01	0.01	0.00	0.01	0.00
4	-3.41	0.01	0.01	0.02	0.00	0.00	0.01
5	-3.20	0.01	0.01	0.02	0.00	0.00	0.01
6	-3.01	0.00	0.00	0.02	0.00	0.00	0.01
7	-2.81	0.00	0.00	0.02	0.00	-0.01	0.01
8	-2.60	0.00	0.02	0.02	0.00	-0.01	0.01
9	-2.40	0.01	0.07	0.02	0.01	0.00	0.01
10	-2.21	0.03	0.14	0.01	0.02	0.01	0-.00
11	-2.01	0.04	0.24	0.01	0.03	0.01	0.00
12	-1.81	0.06	0.39	0.01	0.05	0.01	0.00
13	-1.61	0.08	0.57	0.00	0.07	0.01	0.00
14	-1.41	0.10	0.76	0.00	0.09	0.01	0.00
15	-1.21	0.12	0.95	0.00	0.12	0.00	0.00
16	-1.01	0.13	1.07	0.01	0.13	0.00	0.00
17	-0.81	0.17	1.32	0.00	0.17	0.01	0.00
18	-0.61	0.20	1.48	0.01	0.18	0.01	0.00
19	-0.40	0.22	1.59	0.00	0.20	0.03	0.00
20	-0.20	0.28	1.72	0.00	0.21	0.07	0.00
21	0.00	0.31	1.78	0.00	0.21	0.10	0.00

GREEN SEPARATION:

Exp. step	Rel. log E	RT	BT	RR	bt	gt	rt
1	-4.00	0.01	0.02	0.00	0.00	0.00	0.00
2	-3.81	0.01	0.01	0.01	0.00	0.00	0.00
3	-3.61	0.01	0.01	0.00	0.00	0.01	0.00
4	-3.41	0.01	0.02	0.01	0.00	0.00	0.00
5	-3.20	0.01	0.01	0.02	0.00	0.00	0.01
6	-3.01	0.01	0.01	0.02	O.Q0	0.00	0.01
7	-2.81	0.00	0.01	0.02	0.00	-0.01	0.01
8	-2.60	0.00	0.02	0.03	0.00	-0.01	0.01
9	-2.40	0.00	0.00	0.03	0.00	-0.01	0.01
10	-2.21	0.00	0.00	0.03	0.00	-0.01	0.01
11	-2.01	0.02	0.02	0.03	0.00	0.00	0.01
12	-1.81	0.04	0.04	0.03	0.00	0.03	0.01
13	-1.61	0.09	0.11	0.05	0.00	0.07	0.02
14	-1.41	0.15	0.19	0.06	0.00	0.13	0.02
15	-1.21	0.22	0.27	0.08	0.00	0.19	0.03
16	-1.01	0.28	0.33	0.10	0.00	0.24	0.04
17	-0.81	0.35	0.43	0.12	0.00	0.30	0.05
18	-0.61	0.40	0.50	0.14	0.00	0.35	0.06
19	-0.40	0.45	0.57	0.20	0.00	0.36	0.08
20	-0.20	0.51	0.68	0.23-	0.01	0.41	0.09
21	0.00	0.61	0.79	0.35	0.01	0.47	0.14

RED SEPARATION:

Exp. step	Rel. log E	RT	BT	RR	bt	gt	rt
1	-4.00	0.02	0.03	0.00	0.00	0.02	0.00
2	-3.81	0.02	0.02	0.01	0.00	0.02	0.00
3	-3.61	0.02	0.01	0.01	0.00	0.02	0.00
4	-3.41	0.01	0.01	0.03	0.00	0.00	0.01
5	-3.20	0.01	0.01	0.01	0.00	0.01	0.00
6	-3.01	0.00	0.00	0.00	0.00	0.00	0.00
7	-2.81	0.00	0.00	0.01	0.00	0.00	0.00
8	-2.60	0.00	0.03	0.00	0.00	0.00	0.00
9	-2.40	0.01	0.05	0.02	0.01	0.00	0.01
10	-2.21	0.02	0.08	0.05	0.01	-0.01	0.02
11	-2.01	0.04	0.13	0.15	0.01	-0.03	0.06
12	-1.81	0.08	0.19	0.24	0.01	-0.03	0.10
13	-1.61	0.14	0.25	0.40	0.01	-0.03	0.16
14	-1.41	0.20	0.30	0.53	0.01	-0.02	0.21
15	-1.21	0.26	0.37	0.65	0.01	-0.01	0.26
16	-1.01	0.31	0.40	0.76	0.00	0.00	0.30
17	-0.81	0.35	0.45	0.86	0.00	0.01	0.34
18	-0.61	0.40	0.49	0.96	0.00	0.01	0.38
19	-0.40	0.45	0.55	1.04	0.00	0.04	0.42
20	-0.20	0.49	0.59	1.13	0.00	0.04	0.45
21	0.00	0.54	0.64	1.18	0.00	0.07	0.47

NEUTRAL EXPOSURE:

Exp. step	Rel. log E	RT	BT	RR	bt	gt	rt
1	-4.00	0.00	0.01	0.00	0.00	0.00	0.00
2	-3.81	0.00	0.00	0.00	0.00	0.00	0.00
3	-3.61	0.00	0.01	0.00	0.00	0.00	0.00
4	-3.41	0.01	0.01	0.01	0.00	0.00	0.00
5	-3.20	0.01	0.03	0.00	0.00	0.00	0.00
6	-3.01	0.01	0.06	0.00	0.01	0.00	0.00
7	-2.81	0.02	0.11	0.00	0.01	0.00	0.00
8	-2.60	0.03	0.20	0.01	0.02	0.01	0.00
9	-2.40	0.06	0.35	0.06	0.04	0.00	0.02
10	-2.21	0.11	0.53	0.12	0.06	0.01	0.05
11	-2.01	0.19	0.75	0.19	0.08	0.04	0.08
12	-1.81	0.31	1.04	0.28	0.10	0.10	0.11
13	-1.61	0.44	1.31	0.40	0.11	0.17	0.16
14	-1.41	0.56	1.56	0.50	0.13	0.23	0.20
15	-1.21	0.68	1.79	0.57	0.14	0.30	0.23
16	-1.01	0.78	2.02	0.63	0.16	0.37	0.25
17	-0.81	0.87	2.23	0.69	0.17	0.42	0.28
18	-0.61	0.93	2.36	0.72	0.18	0.46	0.29
19	-0.40	1.00	2.52	0.76	0.19	0.51	0.30
20	-0.20	1.16	2.75	0.84	0.20	0.62	0.34
21	0.00	1.40	3.03	0.98	0.20	0.82	0.39

CLAIMS:

1. A photographic element comprised of

a support and, coated on the support,

a sequence of superimposed red-, green- and blue-recording silver halide emulsion layer units that produce silver images of substantially the same hue upon processing, and one of said units contains a dye image forming compound capable of forming a dye image spectrally distinguishable from the silver images on development,

and a fluorescent or luminescent layer located between two of the non-dye image forming units.

2. A photographic element as claimed in claim 1 in which the dye image-forming compound is a photographic colour coupler, a dye which is hypsochromically shifted out of the visible spectral region by means of a blocking group which is removed as a function of development, a leuco dye or another substance which becomes coloured on oxidation, or a redox dye releaser.

3. A photographic element as claimed in claim 1 or 2 in which the fluorescent layer is located adjacent to the green image-recording unit.

4. A photographic element as claimed in any of claims 1-3 in which the blue image- recording unit contains a photographic colour coupler.

5. A photographic element as claimed in any of claims 1-3 in which the fluorescent layer is located between the blue and green image-recording units and the dye image-recording compound is located in one of the green- and red-image forming units.

6. A photographic element as claimed in any of claims 1-5 wherein the emulsion layer unit furthest from the support is a blue recording layer unit, the emulsion layer unit closest to the support is a red recording layer, and an interlayer between the blue and green recording layers comprises a blue-absorbing (yellow) filter layer.

7. A method of obtaining from an imagewise exposed photographic element as defined in any of claims 1-6, separate electronic records of the imagewise exposure to each of the blue, green and red portions of the spectrum comprising

(a) photographically processing the photographic element so as to produce 3 silver images and a dye image corresponding to one of the silver images,

(b) transmission scanning the element through two different filters,

(c) reflection scanning by exciting the fluorescent or luminescent layer with radiation of one wavelength and reading the emitted radiation at another wavelength,

(d) obtaining the required colour records by mathematically manipulating the data acquired.

8. A method of obtaining from an imagewise exposed photographic element as claimed in claim 7 wherein the densities of the image records were read by scanning for transmission density through blue and red filters, and scanning for reflection density in which the illuminating light is filtered through a green dichroic filter and the light returning to the densitometer is filtered through a red filter.

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Patents Act 1977
Examiner's report to the Comptroller under Section 17
(The Search report)

Relevant Technical Fields (i) UK Cl (Ed.N) G2C (CC8BX, CC8X, CDBIE, CDBX) (ii) Int Cl (Ed.6) G03C **Databases** (see below) (i) UK Patent Office collections of GB, EP, WO and US patent specifications. (ii) WPI	Application number GB 9418656.6 Search Examiner MR M K B REYNOLDS Date of completion of Search 12 OCTOBER 1995 Documents considered relevant following a search in respect of Claims :- 1-8

Categories of documents

X: Document indicating lack of novelty or of inventive step.

Y: Document indicating lack of inventive step if combined with one or more other documents of the same category.

A: Document indicating technological background and/or state of the art.

P: Document published on or after the declared priority date but before the filing date of the present application.

E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.

&: Member of the same patent family; corresponding document.

Category	Identity of document and relevant passages	Relevant to claim(s)
X	US 4543308 (AGFA) columns 11-12, Examples 6-7	1-2, 4

Databases: The UK Patent Office database comprises classified collections of GB, EP, WO and US patent specifications as outlined periodically in the Official Journal (Patents). The on-line databases considered for search are also listed periodically in the Official Journal (Patents).